AGU Fall Session 1996

El Niño events over 1980-1995
simulated and forecasted with a simple coupled ocean-atmosphere model

C. Cassou, C. Périgaud, L.L. Fu, J.P. Boulanger
CALTECH - Jet Propulsion Laboratory - NASA
4800 Oak Grove Drive, PASADENA - CA - 91109

B. Dewitte
GRGS, 14 Av. Edouard Belin, 31055 Toulouse, France

Coupled mechanisms at play in ENSO forecast series simulated with the Cane and Zebiak's model are first investigated during the 1980-1995 period. The coupled model shows a tendency to predict warm events, with growing easterly wind anomalies in the central Pacific and deepening thermocline anomalies in the eastern Pacific. This happens whether the forecasts are initialized with standard conditions (conditions simulated by the model forced by FSU winds) or with observed conditions (baroclinic fields derived from XBT and altimetry).

The model warm tendency is related to the parametrization of the subsurface temperature, function of the thermocline depth anomalies. The model assumes that the temperature is much less sensitive to a thermocline shoaling than to a thermocline deepening whereas XBT data over 1980-1995 shows that it should be symmetric for cold and warm events. With a symmetric parametrization, the forecast tendency to simulate warm events is greatly reduced. Due to deficiencies in the atmospheric model, forecasts undergo a strong initial shock. Wind anomalies are indeed located too close to the SST anomalies in the eastern Pacific and generate strong Ekman currents which converge (diverge) if the initial conditions are warm (cold). The atmopsheric model was then replaced by a statistical model based on SVD decomposition between SST and wind over 1980-1995. The transition from forced to coupled conditions are then found much smoother. The first months of coupled simulations are very close to the forced simulations and to the observed SST, wind and thermocline anomalies.

However, forecasts progressively drift away from the forced simulations in case of decaying warm or cold events. In a forced context, SST changes are mostly due to the term of upwelled temperature gradient anomaly by the climatologic current whereas in a forecast context, the meridional advection by the climatologic current progressively becomes dominant. Further analysis of the mechanisms involved in the mixed layer model is under investigation with the objective of reducing the drift between forced and coupled simulations.